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THE VALUE OF GROUND LEGUME HAYS IN THE RATIONS OF FALL PIGSBy N. R. Ellis, J. H. Zeller, and J. X. King
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The use of alfalfa in the winter hog ration, either in the form of hay or meal, has become a widely accepted practice. The cured alfalfa provides a good substitute for summer pasture in supplying carotene and other vitamin factors, calcium and other minerals, and protein. Feeding experiments have shown that the alfalfa can best be fed either separate from other feeds as hay or ground and mixed with the concentrates. The bulky nature of the hay and meal together with the relatively high fiber content has limited the quantity which could be fed with profit. In general, 5 to 10 percent of hay, either ground or unground, has been considered the most desirable level although good evidence has been offered to show that somewhat more can be used. For example, as much as 8 percent of fiber has been shown to be well tolerated, a level which permits the use of as much as 20 percent of a hay of 30 percent fiber content in a mixture with corn, tankage, and linseed meal.

Other hay crops, particularly the legumes such as the clovers and soybeans, have been used in place of alfalfa. Experimental data on these other forages, however, appear to be rather limited, especially as regards the quantities which can be fed and still permit normal gains and high economy of feed utilization.

The present experiments were undertaken for the purpose of obtaining information on the greater use of home-grown legume hays in the growing and fattening ration. The forages thus far studied include alfalfa, sericea lespedeza, and Virginia soybean all of which have been fed at graded levels in order to gain a better idea of their upper limits of usefulness.

Plan of Experiments

Fall-farrowed pigs were fed in a series of lots at the Beltsville Research Center, Beltsville, Md., during the winter and early spring months of each year since 1936-37. Alfalfa hay was used the first 2 years, sericea the next two, and soybean the last two, making a total of 6 experiments. A good grade of locally grown, field-cured hay (U. S. No. 2 or equal) was ground and incorporated into the diets at levels of 5, 10, 15, and 20 percent. A check lot fed a diet containing no ground forage was included in each experiment. The other constituents were ground yellow corn, digester tankage, linseed meal, and mineral mixture in the percentage as shown in table 1. The proportions of tankage and corn were adjusted by diets to provide approximately the same protein and energy contents in the series of 5 diets. The diets were further adjusted to a widened nutritive ratio at lot averages of 125 pounds live weight of pigs. The mixed diets were self-fed in all experiments and the pigs were confined in concrete-floored pens. Eight pigs were placed in each of the 5 lots in the first experiment with alfalfa meal and 10 in each lot in all subsequent experiments. The average initial weights of the pigs ranged from 45 to 63 pounds in the 6 experiments. At the start of each experiment the pigs were distributed by lots according to a definite plan of statistical arrangement, in order to compensate for experimental error due to vari-

abilities in age, weight, breeding, and sex. The pigs were weighed, the feed consumption recorded at periodic intervals, and finally the pigs removed from the feed lot at approximately 225 pounds live weight except for occasional sick or unthrifty animals which were removed at lighter weights.

TABLE 1

The percentage composition of the pig diets

Constituents	Percentage in lot-				
	1	2	3	4	5
Ground hay.....	0	5	10	15	20
Mineral mixture.....	1	1	1	1	1
Linseed meal	4	4	4	4	4
Tankage - Period 1.....	11.8	11.2	10.6	10.0	9.4
" " 2.....	6.0	5.7	5.4	5.1	4.8
Ground yellow corn - Period 1.....	83.2	78.8	74.4	70.0	65.6
" " " 2.....	89.0	84.3	79.6	74.9	70.2

Results

The growth and feed-utilization data showed surprisingly uniform results from year to year and for the different forages and their content in the diets. On the whole, the rates of gain for all lots within each pair of experiments on a given forage were not greatly different, averaging 1.65 pounds per day for the alfalfa series, 1.70 for the sericea, and 1.67 for the soybean. Feed consumption per 100 pounds of gain ranged from an average of 383 pounds in the alfalfa experiments to 402 pounds on sericea with soybean intermediate at 396 pounds.

The figures for the individual lots given in table 2 show certain trends and in a few cases some significant differences. When corresponding lots within each pair of experiments for a given kind of hay are averaged, the maximum rates of gain are found to occur in the lots fed the 5 and 10 percent levels regardless of the forage used. The decline in rate of gain on the 15 and 20 percent levels is least pronounced in the sericea experiments and most in the soybean. A comparison of the 10 and 20 percent levels of ground soybean hay shows a significant difference in rate of gain in both experiments. The relatively pronounced increase in rates of gain of animals on the 5 and 10 percent levels of ground soybean hay over the check lots is also noteworthy.

TABLE 2

The average daily gain and feed consumption per unit gain of the various lots of pigs fed different levels of ground legume hays

Forage content of diet Percent	Alfalfa			Sericea			Soybean		
	Average		Feed	Average		Feed	Average		Feed
	daily		consumed	daily		consumed	daily		consumed
	Year	gain	lbs. gain	Year	gain	lbs. gain	Year	gain	lbs. gain
	Pounds	Pounds		Pounds	Pounds		Pounds	Pounds	
0	1937	1.51	374	1939	1.77	356	1941	1.52	415
	1938	1.68	343	1940	1.54	380	1942	1.61	371
5	1937	1.60	398	1939	1.65	386	1941	1.71	399
	1938	1.88	357	1940	1.78	374	1942	1.82	368
10	1937	1.61	394	1939	1.68	396	1941	1.79	389
	1938	1.83	361	1940	1.80	390	1942	1.74	367
15	1937	1.51	413	1939	1.77	408	1941	1.67	424
	1938	1.77	376	1940	1.62	429	1942	1.70	383
20	1937	1.46	408	1939	1.67	452	1941	1.61	444
	1938	1.67	402	1940	1.67	446	1942	1.52	399

The data on feed requirements in general show the highest efficiency in the experiments where alfalfa was used. The amount of feed required per 100 pounds gain gradually increased with increasing level of alfalfa in the diet and, resulted in a definite saving of concentrate feeds. The value of this forage compared to the corn, tankage, and linseed meal mixture increased steadily along with increase in alfalfa content of the diet in the first experiment to approximately 67 percent in the lot which received the diet with 20 percent of alfalfa while in the second experiment a maximum value of 50 percent was secured on the 10 percent level. In other words every 2 pounds of alfalfa consumed saved 1 pound of concentrates as calculated on the basis of the lots fed no forage.

Increasing levels of sericea in the diet showed a somewhat greater rate of increase in feed requirements per unit gain than in the case of alfalfa. Accordingly, any significant saving of concentrates through the use of the sericea is somewhat problematical. The average of the 2 years' tests indicated a small saving up to the 10 percent level although only the second year's results showed a consistent trend. The average value of the sericea fed at the 10 percent level amounted to approximately 38 percent of that of the concentrates as compared to 50 percent for alfalfa fed at the same level. The saving of concentrates at the 20 percent level was too low to justify the use of the sericea.

Ground soybean hay showed an unusually high replacement value for the concentrate feeds up to the 10 percent level. At this level an average of 36.8 pounds of ground soybean hay saved 52.1 pounds of concentrates per 100 pounds of gain as compared to the feed consumed in the check lots. This is a much greater saving (142 percent) than was obtained with alfalfa. At the 15 and 20 percent levels the

additional soybean hay saved little, if any, concentrate although even at the 20 percent level, every 3 pounds of soybean hay which was fed replaced 2 pounds of concentrates. In other words, the saving at the 15 and 20 percent levels was at the expense of that at the two lower levels.

Summary

The results are reported of experiments on pigs fed from weaning to market finish at 225 pounds on diets containing 0, 5, 10, 15 and 20 percent respectively of ground alfalfa, sericea, and soybean hays. Somewhat more rapid gains were secured on the 5 and 10 percent than on the other levels. Up to the 10 percent level the ground hays effected an appreciable saving of concentrates. The soybean hay stood out as especially valuable in this respect. The alfalfa was somewhat less valuable while the sericea ranked as a poor third. These rankings of relative values need to be taken with some reservation since the 3 forages were not fed together within a single experiment but over a period of 6 years. The greater use of ground soybean hay is suggested, however, on farms where this forage is available.

